UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

APPROXIMATE RELATIONSHIPS BETWEEN RIVER INFLOWS AND THE LAKE LEVEL AND DISSOLVED-SOLIDS CONCENTRATION OF PYRAMID LAKE, WASHOE COUNTY, NEVADA

By Lawrence H. Smith

Open-File Report 82-80

Carson City, Nevada

1981

UNITED STATES DEPARTMENT OF THE INTERIOR

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The following analysis is part of a much larger Geological Survey report presently in review. A request by the Nevada Division of Water Planning for the analysis has made a more timely release desirable.

Prior to the 1930's, the Truckee River channel split in the vicinity of Nixon, Nev., and the river flowed into either or both of the topographically closed basins of Pyramid and Winnemucca Lakes. Out-of-basin diversions begun on the Truckee River at Derby Dam in 1905 diminished the average streamflow so that both lakes began to recede. By the early 1930's, the river was flowing only into Pyramid Lake, and in 1938 Winnemucca Lake became dry. The level of Pyramid Lake has continued to decline, reaching a 100-year low in 1967 and recovering slightly in the 1970's (figure 1) because of above-average river flows. In the same period, the concentration of dissolved solids in the lake has increased (figure 2).

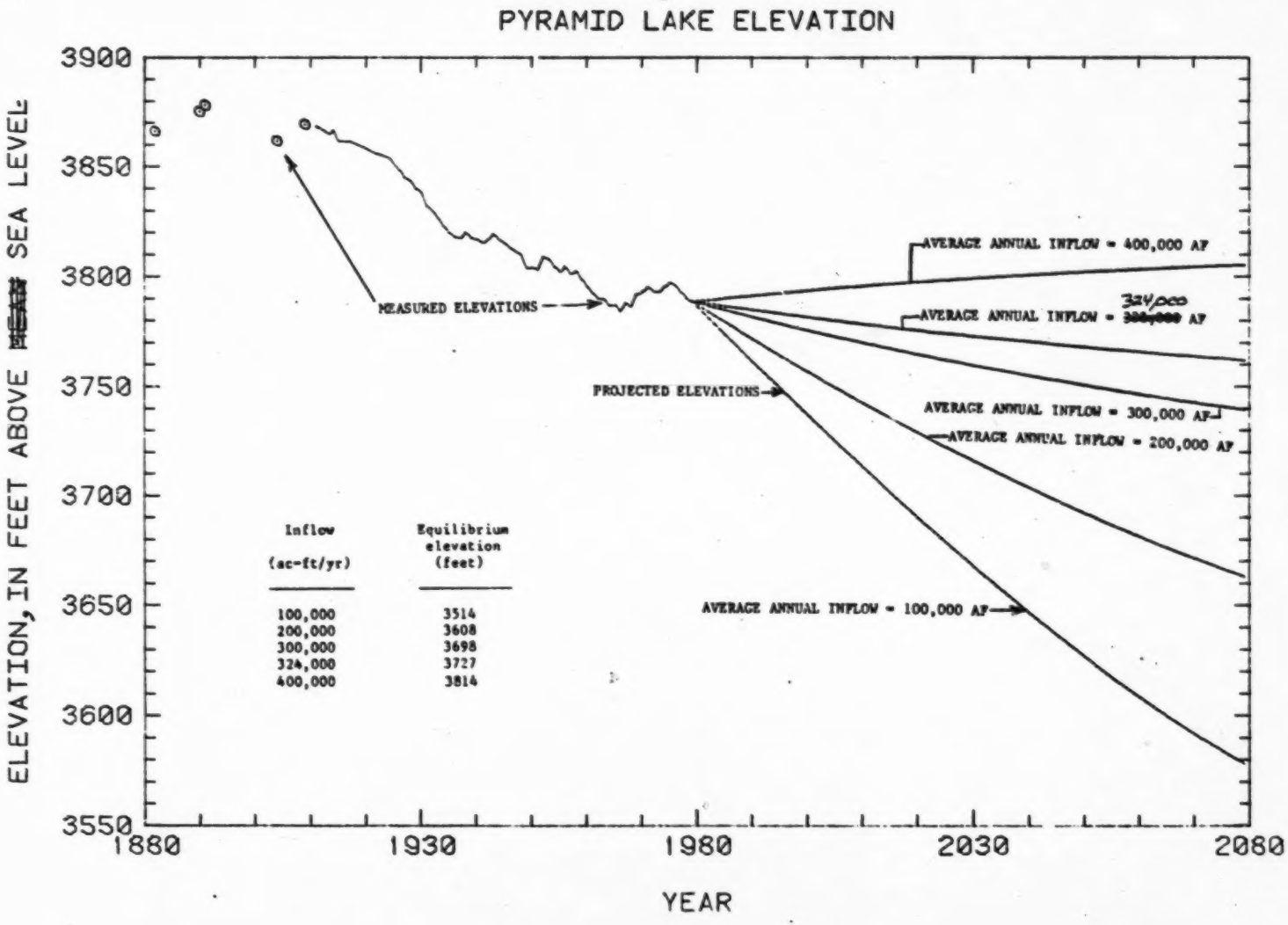

FIGURE 1.--Water-surface elevation of Pyramid Lake, 1882-1980, and estimated trends of lake level for several average annual inflows, 1980-2080.

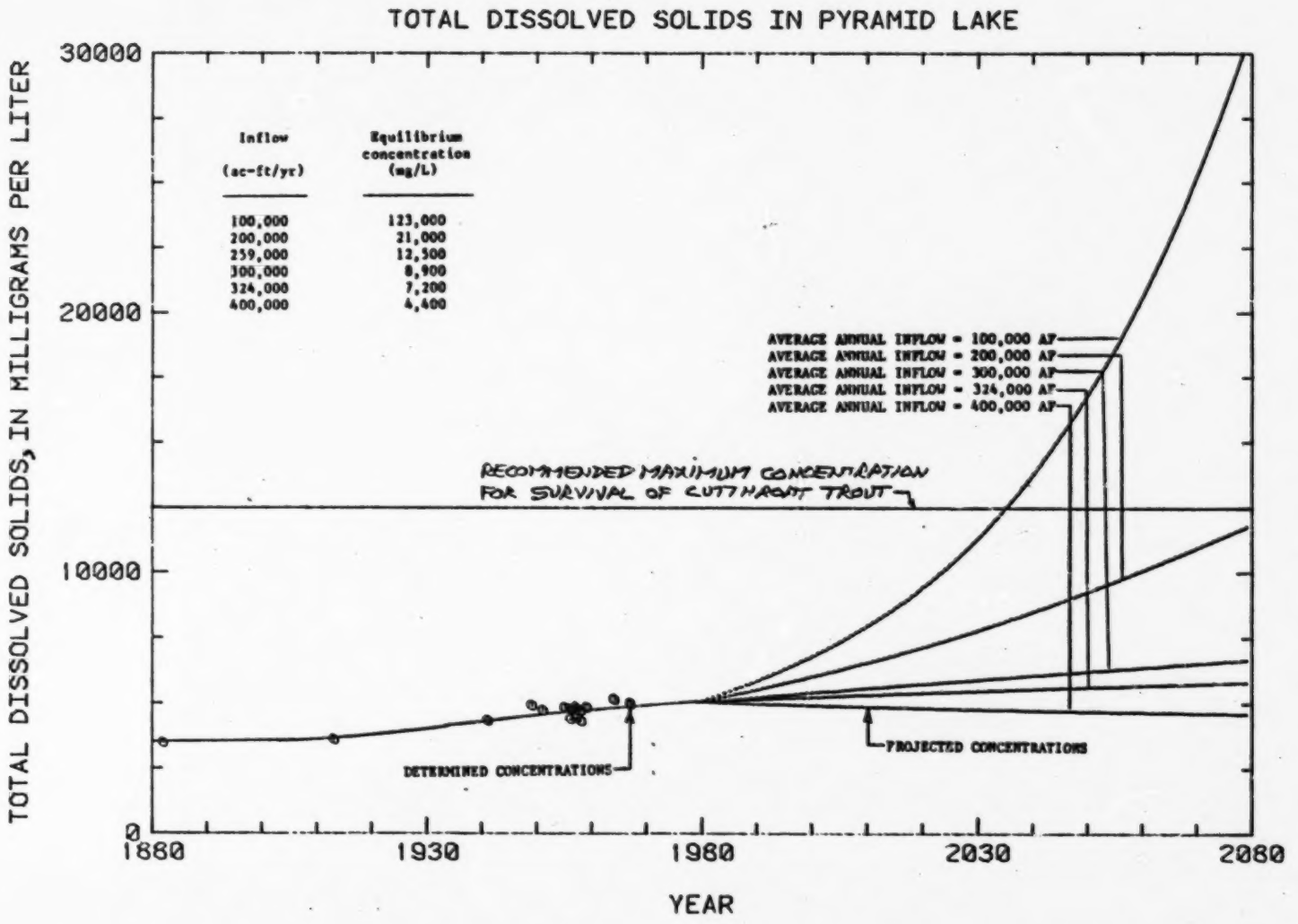

FIGURE 2.--Dissolved-solids concentration of Pyramid Lake, 1882-1980, and estimated trends of concentration for several average annual inflows, 1980-2080.

Continuing litigation involving water rights for Pyramid Lake and changes in upstream water use make prediction of future river flows into Pyramid Lake impossible. However, with some assumptions, estimating lake elevation and dissolved-solids concentrations is possible for a reasonable range of river inflows. Assuming that additions to the lake are composed entirely of Truckee River inflows plus an average precipitation of 0.56 foot per year (Harding, 1965, page 109), and that losses are composed of 4 feet per year of evaporation from the lake surface (Harding, 1965, page 112), figure 1 projects trends in lake level for a number of average annual flows between 100,000 and 400,000 acre-feet. The curve for 324,000 acre-feet projects elevations on the basis of recent (1970 to 1979) average annual flow.

Similarly, assuming that the lake presently contains about 140 million tons of dissolved salts, and that salts added by inflow or removed by chemical precipitation during the next century will cause a negligible change in this quantity (Glancy and others, 1972, page 1172), figure 2 projects trends in the concentration of dissolved solids in the lake. These estimates suggest that the concentration would eventually exceed the reported tolerance limit for cutthroat trout of 12,500 mg/L (Taylor, 1972, page 4) for average annual river flows of less than 260,000 acre-feet (equilibrium lake levels of less than 3,660 feet above sea level). Concentrations above 12,500 mg/L could be expected occasionally at average inflows exceeding 260,000 acre-feet because of the large variability in annual river flow.

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